"Renewal of SABSOON"

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LONG-TERM GOALS

The South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) is a real-time coastal ocean observing system on the continental shelf off Georgia. SABSOON utilizes the existing infrastructure of offshore towers maintained by the U.S. Navy as part of a flight training range. The long-term objective for SABSOON is to function both as component of a regional coastal ocean observing system, and as a coastal ocean observatory. It is intended that SABSOON will provide distributed real-time observations and time series records of coastal ocean conditions, and as well as facility that can host specific projects and serve as a test bed for development of new sensor systems.

OBJECTIVES

This one-year renewal of SABSOON was funded under the NOPP FY01 BAA (Topic Area "Renewal of Existing NOPP Projects"). The renewal has supported maintenance of the system, further development and deployment of instrument packages, and is contributing to continued collaboration with an associated modeling program (separately funded by NOPP, Dan Lynch of Dartmouth College, Lead P.I.). The renewal has also provided support for key technical support personnel during a transition period from an independent project to an integrated component of developing regional and national coastal ocean observing systems (see Transitions, below).

APPROACH

Through partnership with the Naval Surface Warfare Center (NAVSEA, Corona CA), and its regional component, the Tactical Aircrew Training System (TACTS, based at the Marine Corps Air Station, Beaufort, SC), offshore platforms have been equipped with meteorological and oceanographic sensors and real-time, two-way communications have been established for SABSOON (Seim, 2000). The eight towers maintained by TACTS are located about 50-100 km offshore, at 25-45 m water depth. As a no-cost partner in the original NOPP project (initiated in FY98), TACTS has actively supported the development of SABSOON. In addition to logistic support (shared helicopter transportation and technical advice), TACTS has provided SABSOON with power and access to its high bandwidth microwave communications network on three central "master" (4-legged) platforms (Fig. 1). The Navy power and communications systems on the five smaller "remote" (3-legged) platforms are more limited. It was decided that installation of separate power and communications at the remote platforms was necessary to support the SABSOON observatory operations and to ensure that there would be no interference with the Navy systems. The basic approach for design of SABSOON systems has been to

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14. ABSTRACT

The South Atlantic Bight Synoptic Offshore Observational Network (SABSOON) is a real-time coastal ocean observing system on the continental shelf off Georgia. SABSOON utilizes the existing infrastructure of offshore towers maintained by the U.S. Navy as part of a flight training range. The long-term objective for SABSOON is to function both as component of a regional coastal ocean observing system, and as a coastal ocean observatory. It is intended that SABSOON will provide distributed real-time observations and time series records of coastal ocean conditions, and as well as facility that can host specific projects and serve as a test bed for development of new sensor systems.

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emphasize real-time data acquisition, flexibility for future additions or modifications of instrument packages, and, where possible, to make instrument packages serviceable from the platform (minimizing the need for weather-dependent ship and diving operations).

Figure 1. The M2R6 platform. This "master" platform is located in 33 m water depth about 60 km offshore. Power on the master platform is generated on site by photovoltaic panels, wind generators and a diesel backup generator. A high-bandwidth microwave network is used for communications between master platforms and shore. Helicopter transportation of personnel is used for most servicing operations.

WORK COMPLETED

SABSOON systems are operational at two of the three master towers (R2, M2). The battery and solar photovoltaic panels for a power system separate from the Navy have been installed at the NE remote platform (R8), and antennas for a SABSOON microwave link between R8 and M2 have been installed. The next steps will be to complete the communications and power systems installations (the latter will include a wind generator, propane backup generator and power monitoring/control system). Some

challenges in the past year have delayed planned system development (particularly at the R8 platform), and, at times, compromised data acquisition. In the late summer and early fall of 2001, problems with the Navy power systems interrupted real-time communications and data acquisition at the R2 platform. From spring until early summer of 2002, helicopter service was not available and SABSOON maintenance and installation operations were limited. Helicopter service (contracted to a private company) was reestablished in the summer. Although causing some gaps in data acquisition, SABSOON will benefit from the ongoing maintenance and upgrade of the Navy systems by TACTS. The Navy installed new banks of batteries at R2 in September 2001 and the Navy's microwave communications system is presently being upgraded.

Additional SABSOON system enhancements have been implemented during the past year. A new ADCP was installed at the R2 tower (bottom-deployed frame about 200 m from the tower), with data acquisition beginning in late June 2002. Automated data processing scripts are being updated and a GUI tool for data QC (with logging of outlier removal, etc.) has been implemented for CTD and ACDP data records. Divers from Skidaway (SABSOON project technicians) and from the Gray's Reef National Marine Sanctuary program (a SABSOON partner) also replaced the camera and cable for the UW fish video system designed by project partner Charlie Barans of South Carolina DNR.

RESULTS

Analyses of SABSOON data records are ongoing. For example, ADCP current records from the M2 tower (~33 m depth) have been analyzed by Harvey Seim and graduate students at UNC, with a harmonic analysis was carried out on each of 13 months. Subsequent study focused on variability in the largest semi-diurnal constituent. Stratification was found to cause significant shifts in vertical shear, ellipticity, tidal phase and ellipse orientation. Estimates of bed stress also vary in time and suggest that surface gravity waves are modulating the properties of the benthic boundary layer and impacting tidal current speed. A linearized one-dimensional momentum balance was used to estimate the eddy viscosity necessary to explain the vertical current structure. Vertical structure of the eddy viscosity was also found to vary with stratification with maximum values ranging from 0.01 to 0.05 m2/s. Comparison of the observations during unstratified conditions with a one-dimensional model that includes a turbulence closure scheme confirms observational estimates of a roughness length of 2-10 cm, consistent with a strong influence of the surface gravity wave field on the benthic boundary layer.

The impact of surface wave forcing on the optical properties of the water column and potential biogeochemical exchange processes on the shelf are also indicated from SABSOON observations. A distinct increase in chlorophyll fluorescence (and in beam attenuation at M2) has been noted when large surface waves are generated in storms (Fig. 2). This is likely due to the suspension of benthic diatoms that are very abundant in the surface sediments of the SAB mid-to-outer shelf, (Nelson et al. 1999) and other fine particles. Comparison of pre- and post-storm SeaWiFS ocean color imagery showed that regional bio-optical properties can be strongly impacted by such storm events.

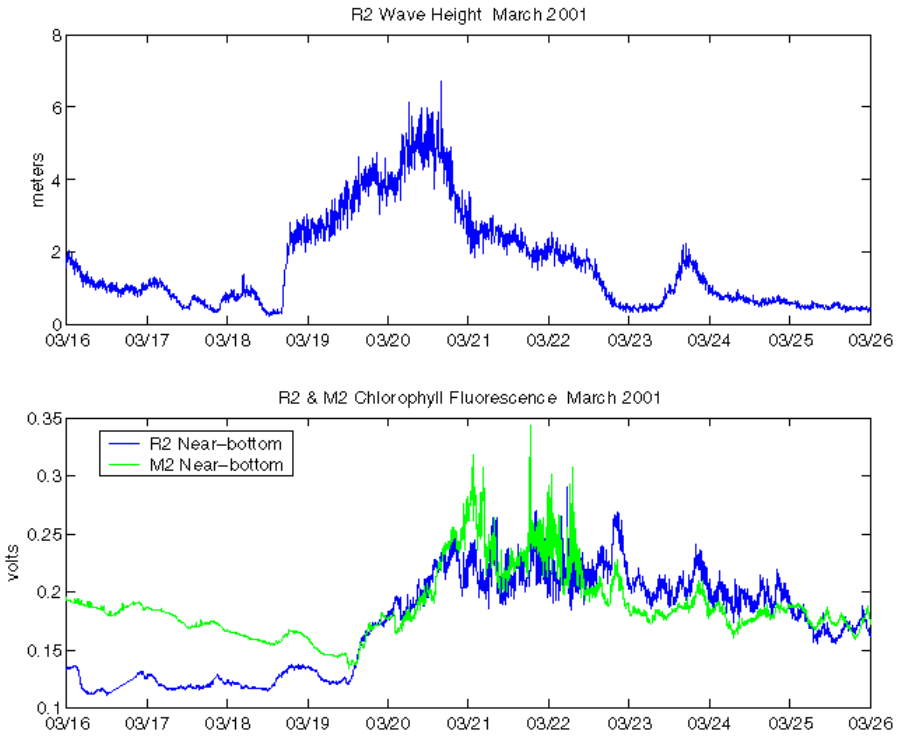

Figure 2. Observations of wave height (at the R2 tower, 26 m depth) and chlorophyll fluorescence (R2 and M2 towers, raw output in volts) obtained during a late winter storm event (March, 2001). Winds were ~15 m s^{-1} from NNE during the build-up of the waves. Regional SeaWiFS chlorophyll imagery showed a 2-3 fold post-storm increase over pre-storm levels, comparable to the increase in in-water chlorophyll fluorescence. Shipboard work suggests that the chlorophyll inventory in surface sediments (largely benthic diatoms) is sufficient to account for this signal if roughly half of the total in surface sediments were suspended during the storm.

IMPACT/ APPLICATIONS

Meteorological, wave and sea surface temperature data are transmitted hourly to the National Weather Service. Hourly updated observations and time series over intervals of 24 hrs, 7 days and 30 days are posted on the project web site (*http://www.skio.peachnet.edu/ projects /sabsoon_web/index.html*). ADCP current and water level records from SABSOON provide input for a local-area, data assimilative circulation model. This is a separate NOPP project and involves collaboration between investigators at Dartmouth College, the University of North Carolina, the National Weather Service, North Carolina Supercomputing Center, Woods Hole Oceanographic Institution and Skidaway Institute. Output from recent model runs can be viewed at the project website (http://www.ncsc.org/nopp/sablam/)

TRANSITIONS

SABSOON P.I.s have participated in a number of workshops, special sessions at scientific meetings, and steering committee meetings focused on the development of the U.S. coastal ocean observing

system, including the OCEAN.US workshop in March, 2002 for planning an Integrated Ocean Observing System (attended by Harvey Seim and Rick Jahnke). The recently initiated Southeast Atlantic Coastal Ocean Observing System (SEA-COOS) program (ONR) is supporting continued maintenance and development of SABSOON. Through SEA-COOS, the project will be integrated within a larger regional framework for NC, GA, SC and FL involving academic institutions in partnership with state and federal agencies. The SEA-COOS network will be built around observing, data management, modeling/data product, and outreach/education subsystems.

RELATED PROJECTS

In addition to the NOPP modeling program described above, SABSOON data is being utilized to complement separate research projects on benthic biogeochemical processes on the shelf (NSF projects of Rick Jahnke), benthic primary production (NSF, Nelson), and application of ocean color imagery in studies of lateral biogeochemical exchange processes on the shelf (NASA, Nelson, Jahnke, Li). The development of an UW video system for fisheries studies, initiated in partnership with Charlie Barans (SC DNR) will continue under SEA-COOS. Further development of instrument/sensor test bed capabilities are being pursued in association with the Alliance for Coastal Technologies (ACT, *http://www.actonline.ws/*). We are also interacting with an NSF/SURA funded project ("Cast-Net", *http://www.cast-net.org/*) that is working to facilitate exchange of data from various SE marine labs and monitoring programs. Improved FGDC compliant metadata records for SABSOON are being implemented through a web-based form developed by Cast-Net and a web-based system for instrument service and calibration records is being developed. An outreach/education effort was recently initiated through collaboration with Dr. Jim Demmers of the Georgia Tech Research Institute. Demmers has received an award from NSF to develop web-based, interactive educational units for K-12 students using the real-time and archived SABSOON data. We intend to link this effort with the Marine Educator programs of the University of Georgia's Marine Education Center and Aquarium (located next to the Skidaway Institute) and further develop this outreach tool as part of the SEA-COOS program.

REFERENCES

Nelson, J.R., J.E. Eckman, C.Y. Robertson, R.L. Marinelli and R.A. Jahnke, 1999. Benthic microalgal biomass and irradiance at the sea floor on the continental shelf of the South Atlantic Bight: Spatial and temporal variability and storm effects. Continental Shelf Research 19: 477-505.

Seim, H.E., 2000. Implementation of the South Atlantic Bight Synoptic Offshore Observational Network. Oceanography 13: 18-23.